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ABSTRACT

This paper provides local educators and policy makers with information about educational indicators and their use. It opens by briefly tracing the history of the educational indicators movement in the United States and then addresses four critical issues or questions about indicators and their use: What is an indicator and an indicator system? How can indicators and indicator systems be used? How do you identify indicators and decide which will be included in an indicator system? and Who needs to be involved? The report examines numerous ways in which indicators can be used: (1) describe problems quickly and clearly; (2) help in monitoring and accountability; (3) assist with evaluations; (4) inform system improvement; and (5) advance policy agendas. The article discusses which indicators should be included and describes how to use models to select the appropriate indicator systems. Also discussed are ways to use frameworks to construct indicator systems, tips on deciding how many indicators to employ in a system, suggestions for developing criteria for judging indicators, advice on using indicator systems' predictive and descriptive capabilities, and information on choosing how to use an indicator system. The paper closes with a discussion of the implications associated with the use of an indicator system. (Contains 55 references.) (RJM)

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Educational Indicators: What Are They? How Can Schools And School Districts Use Them?

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Introduction

For more than a decade the United States has been engaged in a prolonged campaign of educational reform. Federal, state and local policy makers have used a variety of strategies to revamp instruction, enhance the professionalism of teachers and restructure the relationship between schools and their clients (Elmore, 1990). One reform strategy that has attracted the attention of many prominent policy makers and scholars uses "educational indicators" to inform the improvement of educational systems. Evidence of the use of indicators is widespread. Hardly a month passes without the media trumpeting a comparison of student achievement between nations, states, school districts or schools. While many comparisons are based on a single standardized test rather than on multiple or composite indicators, they nonetheless demonstrate the prominence and power of indicator use.

Against this national and international backdrop, local educators are confronting the use of educational indicators as the basis for accountability and school improvement. For example, California's newly enacted Standards-Based Accountability System will require districts to use multiple classroom-based and standardized measures to determine the academic performance of students and thus identify sub-standard schools, which will engage in school improvement programs. While the actual term "indicators" is not used to describe this system, it is clear that indicators are central to this important policy initiative.

The purpose of this paper is to provide local educators and policy makers with information about educational indicators and their use. Although the literature emphasizes international, national and state-level use of indicators, here we consider the implications of these discussions for the use of indicators by local districts and schools. We begin by briefly tracing the history of the educational indicators movement in the United States. We then address four critical issues or questions about indicators and their use: What is an indicator and an indicator system? How can indicators and indicator systems be used? How do you identify indicators and decide which will be included in an indicator system? Who needs to be involved? To answer these questions, we collected and analyzed just over one-hundred documents that comprise the literature on educational indicators. Our goal is to frame discussions leading to the development of CERC's own indicators system.

A Brief History of Educational Indicators

Burstein, Oakes and Guiton (1992) observe that historically the U.S. has developed social indicators when the nation found itself "groping for a handle on problems still only vaguely perceived and at a time of questioning of basic values" (p. 410). This characterizes well the emergence of educational indicators in the American educational reform lexicon.

The history of educational indicators began in 1867 with the establishment of the U.S. Department of Education, which was formed for the expressed purpose of collecting and reporting educational statistics. Recent interest in the use of educational indicators as policy tools is traceable to the development and use of social and economic indicators beginning in the 1960's. In the mid-1960's policy makers used economic indicators in recommending tax cuts which successfully stimulated the nation's economy (Burstein, Oakes & Guiton, 1992; Shavelson, McDonnell & Oakes, 1991). This success precipitated the development and use of social indicators to evaluate the many social programs operating during that period and to justify government spending on these programs.

However, enthusiasm for social indicators soon waned. Policy makers and the general public grew disenchanted with the perceived failure of indicators to prescribe effective interventions for widespread and growing social problems (Burstein, Oakes & Guiton, 1992). The situation was made worse by an overemphasis on the concerns of social scientists at the expense of the needs of policy makers.

Despite these earlier disappointments, in the 1980's educational indicators became prominent fixtures on the educational reform landscape. The literature traces the emergence of educational indicators to the 1983 publication of *A Nation at Risk* and other reports, which used statistics to document the failings of America's public education system (Burstein, Oakes & Guiton, 1992; Bryk & Hermanson, 1993; Selden, 1994). This was followed in 1984 by the Secretary of Education's first "Wall Chart", which provided state-by-state comparisons on SAT scores, per pupil expenditures and the like. Although many analysts questioned the quality of data reported by the Wall Chart, its publication galvanized public attention (Selden, 1994).

Indicators dramatized the problems of public education by providing seemingly tangible evidence. Moreover, critics linked the problems of education to losses in the nation's economic productivity (Decker, Rice & Moore, 1997; Guthrie, 1990; Task Force on Education for Economic Growth, 1983). Increasingly, indicators came to be viewed as more than mere descriptions of the problem; they provided two tools of reform. First, indicators could serve as the basis for holding educational systems accountable (Blank, 1993; Meyer, 1994). Second, indicators could be used to uncover the curricular and instructional causes (McDonnell, et al., 1990) of public education's failings and thereby provide policy makers with solutions (Odden, 1990), echoing the 1960's expectations for the potency of social indicators.

Committed to the potential of indicators as tools of educational reform, organizations and agencies at national and state levels coalesced around the development and use of educational indicators to improve public education (Bryk & Hermanson, 1993; Burstein, 1988; Burstein, et al., 1992; Selden, 1994). Nationally, in 1984 the Council of Chief State School Officers (CCSSO) published a position paper supporting comparisons of states' academic achievement. CCSSO also committed to working with federal and state agencies to enhance their ability to collect, analyze and report assessment information. The Council established an educational assessment center whose mission was to gather and disseminate information on state assessment practices, align state assessment programs and coordinate state, national and international assessments of educational quality.

1985 was a banner year for the federal government's involvement with educational indicators. The National Research Council published a report recommending that the federal government reorganize its efforts to collect and report education data (Burstein, 1988). The U.S. Department of Education's Center for Statistics established plans to reorganize the collection of elementary and secondary school data. The Center also sponsored a study to develop a national indicators system which used data collected by state assessment programs and supported CCSSO's efforts to develop state-level indicators. In addition, the National Science Foundation sponsored the National Academy of Science's study of mathematics and science indicators (Bryk & Hermanson, 1993).

In 1987 the U.S. government supported the Office for Economic Cooperation and Development's cross-national indicator project, which strengthened efforts to establish a system for international comparisons. In the national arena, in 1988 the Hawkins-Stafford Act expanded the National Assessment for Education Progress to include the collection of state-by-state data. This enhanced coordination of data collection across states. The Hawkins-Stafford Act also established the Special Study Panel on Education Indicators to advise the national Center for Education Statistics (Bryk & Hermanson, 1993).

Selden (1994) reports that most states operate educational indicators programs. These programs take three forms: One, some states, including Connecticut and Nevada, operate indicators systems, which collect and report data on key elements of educational systems. Two, other states, including California, Illinois and Louisiana, issue "report cards" which reflect schools' profiles along a number of important dimensions, such as student achievement and demographics and elements of instructional programs. Three, still other states employ educational indicators in accountability systems. California is moving in this direction by enacting its Standards-Based Accountability System.

History bears important lessons for local policy makers and educators who intend to use educational indicators. First, society expects educational systems either to be held accountable for outcomes measured by indicators or to use indicators to improve instructional policies, programs and practices. Second, the latter is a highly complex endeavor which, according to the failures of social indicators in the 1960's, is easily compromised by the limitations of social and behavioral science and a lack of relevance to policy makers.

What Are Educational Indicators? Defining The Concept

Just what are educational indicators and indicator systems? Educational indicators and indicator systems have been defined with differing emphases. While definitions range from simple to complex, the literature is nearly always complementary as the simplest conceptions are also found within or are the bedrock of the most complex ones.

Educational Indicators

The most basic and elementary definitions contend that indicators describe key aspects of schooling (OERI State Accountability Study Group, 1988; Selden, 1985). Here indicators are statistics that are expected simply to provide information about significant features of the

educational system. For example, indicators often describe how students perform on standardized tests, what is being taught, or how much is being spent on education.

Others note that for a statistic to be an indicator, there must be a standard against which it can be judged (Dickson & Lam, 1991). An indicator can be compared to itself over time or across different schools, districts, or other entities. The "standard for comparison" criteria implies that indicators permit evaluation. Given appropriate comparisons, educators can evaluate significant features of schooling with indicator data. Evaluation is typically understood as a one time activity, usually in respect to a particular program. Hence, evaluation is a rather objective and specific exercise that becomes possible when indicators have standards for comparison.

Many purport that the definitive character of indicators is that they act as "vital signs" regarding the "health" of the educational system (Hafner & Buchanan, 1992; Jones & Nielsen, 1994; Kaagan & Coley, 1989; Levesque, Bradby & Rossi, 1996; Oakes, 1986; Nuttall, 1994; Raizen & Jones, 1985). There are two aspects embedded in this conceptualization. First, by serving as the "vital signs" or "early-warning systems," indicators permit the monitoring of education. In contrast to evaluation, monitoring is typically understood as an ongoing activity. Moreover, monitoring has a more complex function than evaluation given this continuous tracking of vital signs.

Second, by providing an assessment of the "health" of a system, indicators provide a basis for making value judgments. As Scheerens (1991, p. 371) explicitly notes, indicators are "statistics that allow for value judgments to be made about key aspects of the functioning of educational systems." In this context, value judgments can be understood as overall assessments that are rather subjective, for there exist no definitive guideposts to determine the health of a system. The use of indicators to support subjective health assessments is more complex than using them to monitor and objectively evaluate educational systems. The former is purported to empower educators by allowing them to draw larger conclusions from their data.

Other definitions go a step further by invoking a policy criterion. That is, a statistic can be considered an indicator only if it is policy-relevant (Burstein, Oakes & Guiton, 1992; Kaagan & Smith, 1985; Shavelson et al., 1987; Shavelson, McDonnell & Oakes, 1989; Special Study Panel on Education Indicators, 1991). Odden (1990, p. 24) contends that the policy makers "want to know what policy levers they can pull in order to improve student performance." Some authors characterize this as an "instrumental usage" of indicators (see Bryk & Hermanson, 1992), because educational improvement is treated as an engineering project in which indicator data inform the construction of rational policies. These critics note that such instrumental use is potentially dangerous, as we may grow to value what is measured over what is difficult to measure but nonetheless valuable.

In summary, our literature review indicates that there are five critical components in defining educational indicators: (1) description, (2) evaluation, (3) monitoring, (4) value judgments, (5) policy-relevance. These components lie on a continuum and are "additive" as indicators are purported to do the most at the end of the list. As a generic synthesis of the available definitions, we provide the following: educational indicators are statistics that describe key aspects of schooling which permit the evaluation and monitoring of schools, programs, and

students. From these activities general assessments (value judgments) of the health of educational systems can be derived and policy-relevant information provided.

Indicator Systems

Indicators are not arbitrary, isolated measures. They are typically found in sets and comprise what is referred to as an indicator system. Like indicators, indicator systems have been defined in a variety of ways. Selden (1994, p. 43) describes them as "statistical reporting programs representing key aspects of the education system." This definition emphasizes indicator systems as a means for straightforward data presentation. However, the more common notion of indicator systems is that they represent relationships between distinct components, providing information on the critical, analytical links (Burstein, Oakes & Guiton, 1992; Jones & Nielsen, 1994; Oakes, 1986; Shavelson et al., 1987; Shavelson, McDonnell & Oakes, 1989). In this approach, indicator systems are based upon a conceptual model of schooling. Indicators are developed for each component of the model and the indicator system permits the examination of relationships between various components. These relations are often assumed to be causal (e.g., increased student expenditures leads to increased student achievement). The implication of this notion of indicator systems is that education processes are understood, measurable, and representable through data.

Others focus on the ways in which indicator systems enable educators to monitor the statistics on an ongoing basis (Levesque, Bradby, & Rossi, 1996). Given their stability, indicator systems support continuous program monitoring. Evaluation, on the other hand, tends to be a one time activity. Finally, there are conceptions of indicator systems which highlight policy uses. Kaagan and Coley (1989, p. 7) propose that an indicator system is "a framework into which an array of indicators are placed for review and analysis, leading to necessary modifications of policy and practice."

As in the case of definitions of individual indicators, the literature's treatment of indicator systems can be seen as a continuum of simple to complex claims of the abilities of such systems. The four functions of indicator systems highlighted by these definitions are: (1) presentation, (2) representation, (3) monitoring, (4) policy usage. As a whole, indicator systems can be considered as a representation of educational systems which enables data presentation, the monitoring of key components, and recommendations for policy modifications. Educational indicators and indicator systems are of course intertwined as the former comprise the latter. The purposes for which indicators are adopted will largely determine the shape of the indicator system. For instance, if indicators are used simply to describe some key aspects of schooling, then the indicator system may only be a tool for reporting data. On the other hand, if indicators are adopted for their policy-relevance, then the indicator system will more likely represent the entire educational enterprise and be a monitoring tool that tracks the critical components of the educational system.

How Can Indicators and Indicator Systems Be Used?

It is apparent, as Selden (1991) observed, that defining educational indicators and indicator systems lies principally in determining how they are used. Thus, we turn our attention to answering the question: How can indicators and indicator systems be used?

In general, the literature identifies five general ways in which indicators can be used by educational systems: to describe the state of the system and thus inform public discourse, or dialogue; to serve as the basis for accountability; to evaluate policies and reforms; to serve as information management systems; and to advance policy agendas. As Porter (1988) observes, indicators are about control. They provide policy makers with tools for shaping the structure and operation of educational systems. Different uses of indicators offer different forms of control over educational systems.

Describing Systems and Informing Public Dialogue

The most straightforward use of indicators is descriptive. Authors agree that indicators can be used to characterize the state (Nuttall, 1994), status (Burstein, Oakes & Guiton, 1992; Edmond, 1992), performance (Burstein, Oakes & Guiton, 1992) and general health (Oakes, 1986) of educational systems. Others push the analytic function of indicators further by claiming that, over time, indicators can chart trends (Guthrie, 1993) or track changes (Oakes, 1986). Several authors express strong reservations about moving beyond using indicators to describe the status of education or trends over time (Shavelson, McDonnell & Oaks, 1989; 1991).

Many authors share the view that policy makers can use indicators to describe and state problems more quickly and clearly (Oakes, 1989; 1991). This clearly builds on the descriptive use of indicators. Shavelson, McDonnell and Oakes (1991) note the limited capacity of indicators to inform policy discussions, warning that indicators cannot be expected to replace the political process for setting goals and priorities. However, Bryk and Hermanson (1993) advance "an enlightenment model" for the use of indicators, arguing that their ultimate function will be to facilitate broad, well informed and sustained public discourse about the means and ends of education.

Most authors go beyond the claim that indicator systems can reveal existing problems and issues. They argue that indicators can serve as an "early warning system" (Nuttall, 1994) which can predict future problems (Guthrie, 1993; Oakes, 1986; Shavelson, McDonnell & Oakes, 1989). This, of course, exceeds the claims of simple description because prediction requires the analysis and interpretation of trends over time in order to anticipate changes in educational conditions and outcomes (Smith, 1988).

Neither describing nor predicting problems and issues, per se, constitute a form of control in educational systems. Public discourse, as Bryk and Hermanson (1993) propose, could lead to the development of common beliefs and values, which ultimately could contribute to a normative form of control over members of an educational system. Despite expressing concerns about using indicators to do more than describe and inform, most authors discuss explain how the descriptive capacity of indicator systems can contribute to control systems that hold educational systems accountable, evaluate programs and reforms or manage information.

Monitoring and Accountability

The literature explains that indicators of educational quality can be employed to hold educational systems accountable (Burstein, Oakes & Guiton, 1992; David, 1987; Jones &

Nielson, 1992; Nuttall, 1994; Oakes, 1989; Ruby, 1994; Selden, 1994). Several states already employ indicators in this way (Nash, 1994; Sanders & Horn, 1994). Richards (1988) identifies many ways in which indicators can be used to monitor and thus hold educational systems accountable. Two that are particularly relevant to this paper are regulatory compliance and performance monitoring.

Regulatory compliance. Indicators can be used to insure that schools meet determined standards. This use of indicators principally focuses on the provision of inputs, such as quality teachers, facilities and instructional materials. Regulatory compliance aims to establish uniformly adequate instructional services (Richards, 1988).

Performance monitoring. Indicators can also be employed as the bases for performance monitoring (Burstein, Oakes & Guiton, 1992; David, 1987; Nuttall, 1994; Selden, 1994). Policy makers establish minimum standards for the student outcomes and hold districts and schools accountable for attaining them. Richards (1988) explains that proponents of this use of indicators argue that it forces public schools into a market-like situation which will result in more effective and efficient operations. That is, schools are sanctioned, positively or negatively, depending on whether or not they meet performance standards.

The use of indicators to hold educational systems accountable for either inputs or outcomes employs a regulatory form of control. A central authority, typically the state, uses indicators to determine whether or not local schools and/or districts meet minimum criteria and rewards those that have met the standard and/or punishes those that have not (Bryk & Hermanson, 1993; Burstein, Oakes & Guiton, 1992; Sanders & Horn, 1994; Selden, 1994.

The literature identifies two limitations of using in accountability systems. First, it establishes a minimum requirement to be reached rather than a platform from which excellence can be launched (Richards, 1988). Second, by focusing on a limited number of outcomes, performance monitoring invites educational systems to corrupt indicators (Oakes, 1989), usually by providing instruction expressly intended to enable students to meet the criteria, or "teaching to the test".

Evaluation

The literature suggests that a major use of indicators is in the evaluation of policies (Nuttall, 1994) and reforms (Burstein, Oakes & Guiton, 1992; Porter, 1991; Ruby, 1994). Evaluation can, according to some authors, enhance the rational bases of policy analysis by providing feedback on the policy effectiveness and efficiency (Nuttall, 1994). Others, however, are less sanguine. Shavelson, McDonnell & Oakes (1989; 1991), for example, caution that indicator systems cannot evaluate programs, because they lack the rigor of design and depth of data and analysis necessary to provide a valid assessment of the relative impact of a program.

According to Scheerens (1994), control is impossible without evaluation. For, evaluation provides feedback which enables education officials to adjust or eliminate existing policies and operations and develop new policies in an effort to enhance an educational system's effectiveness. Control based in evaluation is instrumental because it results in the use of

effective policies to enhance the system's outcomes. It employs a technical mechanism which is rooted in an understanding of what means, or policies and procedures, produce particular ends.

Information Management System

The most comprehensive use of indicators is to inform system improvement, which entails all the uses of indicators. In addition to describing and predicting problems and issues and evaluating policies and reforms, an indicator system would provide diagnoses and prescribe treatments for emergent problems. Indicator systems would become "information management systems" (Scheerens, 1991), which continuously gauge outcomes, explain why output goals have not been reached (Porter, 1991), and identify interventions that will improve student performance (Shavelson, McDonnell & Oakes, 1989). For such information management systems to effect student outcomes, some authors argue that they must be employed at all levels of educational systems, including policy makers, school-site administrators and classroom teachers (David, 1988; Jones & Nielson, 1994; Levesque, Bradby & Rossi, 1996).

In spite of the enthusiasm for using indicator systems as tools for managing systemic improvement, many authors question its feasibility. Bryk and Hermanson (1993) offer perhaps the most pointed criticism of this position, arguing that it is based on a simplistic view of schools, fails to specify how information will influence the educational system, and ignores the limitations of research methods in the social and behavioral sciences. Others add that efforts to use indicators to manage school improvement will be hampered by the absence of a clear model of schooling processes (Oakes, 1986) and the difficulty of measuring important educational factors (Burstein, Oakes & Guiton, 1992; Porter, 1991). However, Scheerens (1991) argues that the "rational" approach, which requires a clear understanding of cause-effect relations, should not be abandoned because individuals and indicator systems do not meet all of the formal requirements of technical rationality.

Advancing Policy Agendas

The literature identifies one use of educational indicators that otherwise receives little attention: advancing policy agendas. This occurs on two levels. First, as Burstein, Oakes and Guiton (1992) observe, indicator systems are political entities in that they tend to reflect the assumptions of the policy makers who create and employ them. Indicators signal what is important and bears attention (Nuttall, 1994). Therefore, policy makers who shape the development of indicators systems can thereby shape the educational policy agenda.

Second, Ruby (1994) adds that policy makers can employ indicators to promote and defend their ideological commitments. This is reinforced by David's (1988) observation that policy makers are swayed more by their opinions and beliefs than by data. Thus, in addition to utilizing information generated by indicator systems to inform policy making, policy makers can employ indicators to bolster preordained positions, either by devising indicators that emphasize "pet" concerns or by selecting data that support predetermined positions. This use of indicators applies a political form control on educational systems by narrowing the range of policy considerations. It thus frames political processes that produce policy decisions.

Once policy makers and administrators determine how an indicator system will be used to control an educational system, they are confronted with the question of what indicators to include. It is to that question that we next turn our attention.

What Indicators Do We Include? Using Models and Frameworks as Guides

Much of the literature on educational indicators is intended to be practitioner-friendly. This work is full of "how-to" suggestions. It is clear from the literature that there are two alternatives for determining which indicators to include in an indicator system. In this section we identify and discuss the "model approach" and the "framework approach." The selection of a model or framework of the educational system is critical since it is typically the basis of the entire indicator system. Therefore, we highlight the similarities and differences between the model and framework approaches. Next we review the parsimony versus extensiveness debate. There are differing views on how complex indicator systems should be. This discussion identifies the advantages and disadvantages (as well as the contradictions) of each argument. We close this section with a review of the frequently cited criteria that should be engaged in choosing indicators.

Using Models to Specify Indicators Systems

Many contend that in order to develop indicators, one must first adopt a model of the educational system (Blank & Gruebel, 1993; Cooley, 1992; Hafner & Buchanan, 1992; Jones & Nielsen, 1994; McDonnell et al., 1990; McEwen, 1993; Nuttall, 1994; OERI SASG, 1988; Shavelson, McDonnell & Oakes, 1989). A model enables educators to identify the key elements of education that they want to be measured. Moreover, models include the theoretical relationships between the components. Again, this is based on the assumption that educational systems are understandable and measurable. The model approach to developing indicators is advocated primarily by those who see indicators as policy-relevant. Models provide clues about or highlight areas in need of intervention. The importance of the model cannot be overstated since the entire indicator system will be derived from this initial model. The model specifies the key areas of interest. These components are operationalized into measurable entities (indicators). The collection of indicators make up the indicator system.

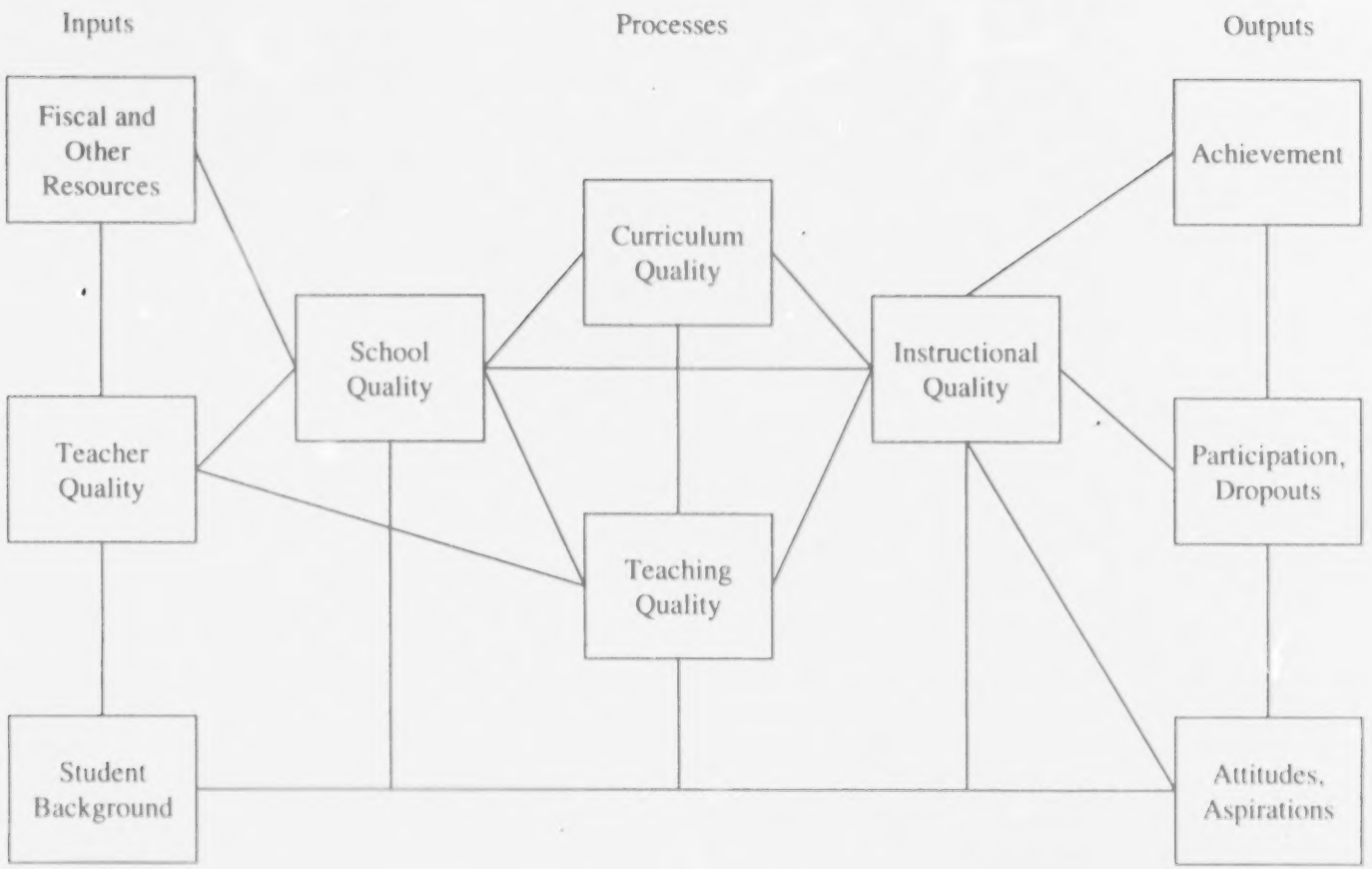
The earliest and most simplistic models considered only "inputs" and "outputs" (i.e., Selden, 1985). This rather straightforward notion simply contends that how much and what you invest into educational systems will effect what comes out. "Processes" are the intermediate category that were soon added to complete the production metaphor (i.e., Raizen & Jones, 1985; Shavelson et al., 1987). To this day, the RAND Corporation's inputs-processes-outputs model (Oakes, 1986; Shavelson et al., 1987) is the most widely cited in the literature. As evident in Figure 1, RAND's model of the educational system specifies a multitude of theoretical relationships.

The model is clearly based upon a production function as school, curriculum, teaching, and instructional quality (the processes) transform the inputs into outputs. Table 1 details RAND's proposed indicator system for mathematics and science education. This table includes the model stages, components, and examples of indicators for each domain. The RAND authors

(Shavelson, McDonnell, and Oakes 1989) identify between 5 and 29 potential indicators for each component. In Table 1 we have selected three illustrative indicators for each domain.

The dominance of the RAND model is evident given the many authors who have made slight modifications to it. Porter (1991) "complexifies" the "processes" by breaking them down into organizational characteristics and instructional characteristics and by adding student non-academic activities, course specific teacher quality, and course specific resources dimensions. Scheerens (1991) adds a context dimension (consisting of consumer demands, school environment, and policy measures at higher administrative levels) and "outcomes" which is represented by employment earnings. The Canadian Educational Quality Indicators Initiative developed a four-dimensional model that adds the responsibilities of the major partners in education (school, family, and society). They also extend student outcomes to include three types: types: cognitive, affective, and behavioral (McEwen, 1993). The National Center on Educational Outcomes has constructed a conceptual model of outcomes that also borrows heavily from RAND's model. They are specifically concerned with resources, educational opportunity and process, and the following outcome measures: physical health, responsibility and independence, contribution and citizenship, academic and functional literacy, personal and social adjustment, and satisfaction (Vanderwood, et al., 1995).

Figure 1: RAND's Comprehensive Model of the Educational System



Source: Oakes (1986, p.9)

Table 1: RAND's Proposed Indicator System

Model Stage	Component	Examples of Indicators
Inputs	Fiscal and Other Resources	• Per-Pupil Expenditure • Teacher Salaries • Resource Adequacy
	Teacher Quality	• Teacher Descriptors (Race, Gender, etc.) • Experience • Comfort With Subject Matter
	Student Background	• Student Descriptors (Race, Gender, etc.) • Socioeconomic Status • Courses Taken and Grades
Processes	School Quality	• Course Offerings • Student Enrollments • Dropout Rates
	Curriculum Quality	• Content – Breadth and Depth • Textbook and Materials Use • Coverage of Core Topics
	Teaching Quality	• Teaching Load • Teaching Methods • Teacher Planning Time
	Instructional Quality	• Pupil/Teacher Ratio • Instructional Time • Access to Labs/Computers
Outputs	Achievement	• Math and Science of All Students • ... of College-Bound Seniors • ... of Prospective Math/Science Majors
	Participation	• Extracurricular Activities • Math/Science Course Taking • Adult Participation
	Attitudes, Aspirations	• Interest and Liking • Social Usefulness • Intended College Major

[adapted from Shavelson et al. (1987, p. 36, 60-2)]l

While the RAND model is the most widely cited in the literature, no single model of the educational system is universally accepted. Some academics are skeptical of "models" since they are very mechanistic and usually engage a production metaphor, which skeptics argue is inappropriate for education (see Bryk & Hermanson, 1992; Bramley, 1995). The "inputs-processes-outputs" production function is seen as a crude economic analogy whose linear reasoning cannot possibly capture what actually occurs in educational systems. Moreover, models contribute to the "instrumental usage" of indicator data. In purporting to have the educational system mapped out, models suggest that indicator data will highlight areas in need of intervention and point to the policy levers that need pulling. This contention is questioned given the weight placed upon the model of something too complex to model. The RAND authors do carefully note that "[t]he relationships depicted...do not constitute a model in either a strict predictive or causal sense"(Shavelson et al., 1987, pp. 9-11). Nonetheless, the logic of the model itself heavily suggests causality through its linear progression. By claiming that "considerable correlational research supports the links among components," Shavelson et al. (1987, p. 11) still invite instrumental usage despite their precautions.

The model approach to developing indicators is mostly pursued by academics. This "objective," social scientific exercise is based on theoretical constructs and is often completely divorced from the daily realities of schooling and local administration. Social scientists tend to make such models complex so they can perform statistical analyses. Despite claims of the purported policy usefulness of indicators and indicator systems, educators may find them largely irrelevant. Models are likely to suggest intervention in areas that are out of the control of local educators. Moreover, this model approach may be interpreted as externally imposed upon schools. Without having participated in its development, educators may feel threatened and have little allegiance to such indicator systems. In the last section of the paper we detail some of the issues surrounding stakeholders.

Using Frameworks to Specify Indicators Systems

Models are not the only basis from which indicator systems can be constructed. Many authors have alternatively proposed "frameworks" for indicators. A framework is generally understood as simply a structure for organizing educational domains of interest. By constructing or adopting a framework, educators are still able to identify the key elements of interest and maintain a stable indicator system without committing themselves to any mechanistic model. Frameworks do not usually imply causal relations among the various components and are not as prone to inviting instrumental usage of the results. Since frameworks are not attempts to build a comprehensive map of the educational system, the data derived from them are more likely to inform discussion rather than prescribe a remedy.

The Council of Chief State School Officers developed a framework that includes student outcomes, instructional time, curriculum content, school conditions, teacher quality, and resources (Blank, 1986). Oakes (1989) is particularly concerned with school context and focuses on three "alterable characteristics" or "enabling conditions:" access to knowledge, press for achievement, and professional teaching conditions. Cuttance (1991) identifies four domains for indicator development: management and organization, ethos and culture, equal opportunity and social justice, and teaching and learning. Gray and Wilcox (1994) are concerned with five key

areas: school aims, the ethos of the school, curriculum organization and assessment, curriculum implementation, and management and administration.

The Special Study Panel on Education Indicators (SSPEI) (1991) recommends that indicators be organized around major issue areas of significant and enduring educational importance. Figure 2 provides the six issue areas and main concepts that the panel suggests for indicator development.

The panel considers "learner outcomes" and "quality of educational institutions" as the most essential and provides detailed sub-concepts for both. Table 2 summarizes their recommendations. There are between three and six sub-concepts identified for each main concept. In Table 2 we provide examples of three sub-concepts for each main concept. In this approach, indicators would be developed to measure the sub-concepts.

As evident, there is quite a bit of similarity between the actual indicators of RAND's proposed system and SSPEI's recommendations. This does raise concern since we have distinguished the model approach from the framework approach. Indeed, the Special Study Panel on Educational Indicators purposely distances their work from RAND's:

> An issue-oriented approach appeared essential...most members of the panel have serious reservations about the wisdom of relying on...a model focusing on a triumvirate of "educational inputs-educational processes-educational outputs." Most panelists view this approach as flawed because it encourages the view that the educational system produces "products"... Such a model may seriously mislead decisionmakers... (SSPEI 1991, p. 9).

Yet, is there really much difference between the issue areas and the model? The one major difference that was raised in our discussion of indicator systems is that models purportedly are a representation of the educational system while frameworks are not. However, despite this difference, we find the implications of SSPEI's and RAND's approach to be nearly identical. While models implicitly invite the instrumental usage of indicator data, SSPEI's framework explicitly does so:

> The strength of indicators, in short, is that they focus attention on critical issues. This focusing property means that they can become levers for change; indicators, by themselves, can become tools of reform because they are such excellent devices for public communication (1991, p. 7).

While RAND relies on a model based on a production function, SSPEI promulgates an "education and economic productivity" issue area. The former represents a problematic assumption of congruity between two types of systems. The latter represents the narrow assumption that one of the primary purposes of schooling is to prepare students for new, high-tech jobs. Both oversimplify educational systems. Moreover, RAND's model and SSPEI's issue areas framework both represent external impositions of academic "expertise" onto local educators.

Figure 2: SSPEI's Six Issue Areas and Their Main Concepts

Learner Outcomes	Quality of Educational Institutions	Readiness for School	Societal Support for Learning	Education and Economic Productivity	Equity
•Core Content •Integrative Reasoning •Attitudes & Dispositions	•Learning Opportunities •Teachers •Conditions of Teachers' Work •Schools as Places of Purpose and Character •School Resources	•Status of Young Children and Their Families •Educational Services	•Family Support •Community Support •Cultural Support •Financial Support	•Education Pipeline •Economic Consequences of Education and Training •Workplace Support for Education •R&D Role of Higher Education	•Student Demographics •Educational Institutions •Educational Services

Source: SSPEI (1991, p.28)

Table 2: Two SSPEI Issue Areas

Issue Areas	Main Concepts	Examples of Sub-Concepts
Learner Outcomes	Core Content	• English • Mathematics • Natural Science
	Integrative Reasoning	• Scientific & Technological Literacy • International Understanding • Comprehending Pluralism
	Attitudes and Dispositions	• Tolerance • Self-Direction • Responsibility
Quality of Educational Institutions	Learning Opportunities	• Exposure to Subject Matter • Nature of Learning Opportunities • Assignment of Teachers and Students
	Teachers	• Individuals Entering the Profession • Pre-Service Training • Competence in Classroom Setting
	Conditions of Teachers' Work	• Basic Classroom Resources • Supporting Resources • Influence Over Core Matters of Work
	Schools as Places of Purpose and Character	• Clarity of Mission • Human Environment • Basic Safety & Order
	School Resources	• Buildings • Libraries • Labs & Technology

[adapted from SSPEI (1991, p. 64, 71)]

Although SSPEI's framework shares many of the same problems as RAND's model, we do feel that the framework approach is distinguishable from the model approach. By definition, the model approach is too academic and may be threatening to local educators. The expectations of the system will largely determine whether a model or a framework should shape the construction of the system. Again, it is important to be clear about your agenda at the outset. If you want a policy-relevant information management system, then the model approach is the most appropriate. Such usage demands information pertaining to the relationships between various educational components. If you are only interested in a system that provides a general description of educational processes, then the framework approach is more appropriate. Here the informational demands are fewer as the data would be engaged in more limited purposes.

In deciding whether to rely on a model or framework to guide the development of an indicator system, educators should begin by asking themselves a critical question: What are your reasons for wanting an indicator system? If external forces such as the state are requiring data about schools, then you have a special set of issues to contend with. When the state requires data they usually want it for comparative purposes and schools are responsible for collecting data in a compatible fashion. The recent move towards accountability systems resonates with these concerns.

On the other hand, if you want data that will be used solely for local efforts, then there is much more flexibility and freedom in developing the system. If local educators are concerned with improving instruction, then data can be collected and reported in a fashion that is more relevant to teachers. The purposes of the indicator system will also determine how complex it is.

Parsimony versus Extensiveness

Another issue that must be confronted in developing indicator systems is deciding how many indicators to employ. Both parsimonious and extensive systems have advantages and disadvantages. It is widely agreed in the literature that there is no one statistic that can capture the pulse of education. Unlike financial quarters, there is no "Dow Jones" average for education (SSPEI, 1991). Yet how many is enough? Stecher and Koretz (1991) understand the dilemma well:

> There is a fundamental tension between simplicity and comprehensiveness that is inherent in the definition of indicators. By design, indicators are simple statistics, but they are valued as a way to understand diverse, complex systems. An immediate challenge in developing indicator systems is to balance simplicity and comprehensiveness. A desire for completeness and explanatory power argues for increasing the number of variables that are included, the number of ways each is measured, and the level of detail of observations. However, indicator systems are valuable because they are limited, succinct and parsimonious. The purpose of indicators is to illuminate key elements of larger phenomena in a simple and concise manner, and this purpose precludes measuring comprehensively. One cannot achieve both goals; compromise is required (p. 58).

In the literature, most advocate compromising comprehensiveness. An extensive indicator system would be unmanageable (Shavelson, McDonnell & Oakes, 1989) and too complex (Blank, 1993), lacking utility (Porter, 1991). If educators are inundated with data there will not be any strong messages sent. Moreover, a comprehensive set of indicators would be very costly to develop and maintain (Oakes, 1986). While most simply state that indicators must be few in number, others provide concrete suggestions. Dickson and Lam (1991) recommend between five and eight indicators, the Council of Chief State School Officers suggests twelve (Blank, 1993), and Hafner and Buchanan (1992) recommend in the ballpark of twenty or fewer. It is evident that there is a lack of consensus around the notion of "few."

There are at least a few critics of parsimonious indicator systems. The Special Study Panel on Educational Indicators (1991) contend that the search for a limited number of key educational indicators is misguided. A limited set of indicators could not do justice to the complexity of the educational enterprise and would end up defining the educational agenda instead of reflecting it. Likewise, Porter (1988) warns that parsimony is problematic and may strengthen the prevalent beliefs that teaching and learning are straightforward. SSPEI does recognize that hundreds of indicators would be overwhelming. "Indicators must be comprehensive, yet disciplined enough to be manageable"(SSPEI, 1991, p. 8). For the two issue areas for which the panel provides details, there are 35 sub-concepts which could be developed into indicators. Others note that the actual number of indicators may effect the reaction of educators to indicator systems:

> While understanding the desire of busy policy-makers and managers for a limited and simple set of indicators and the researchers' desire for a parsimonious one, there are dangers that arise from keeping the set small. The greatest danger is that of corruptibility of the behaviour of those whose performance is being monitored. The best-known example is teaching to the test... (Nuttall, 1994; p. 23).

While the RAND authors and the SSPEI differ on the parsimony versus extensiveness debate, we would not conclude that these differences are characteristic of the model approach and the framework approach to developing indicators. The majority in both camps favor parsimony. The main thrust of the parsimonious argument seems to concern policy-usefulness. After all, if there are too many numbers, it will not be clear which policy levers need to be pulled. Intrinsic to the model approach, there is a contradiction between their calls for parsimony and policy-usefulness and their basing of indicator systems on theoretical models. The "objective," social scientific exercise of developing models requires extensiveness so that statistical procedures can be adequately performed and are not underspecified. Indeed, for the ten components of their model, the RAND authors discuss a total of at least 85 indicators! (see Shavelson, McDonnell & Oakes, 1989). This is parsimony? The Massachusetts Association of School Superintendents developed indicators for their school system based on RAND's model. Their proposed indicator system includes 71 indicators (Hafner & Buchanan, 1992, pp. 84-5). It is simply not clear how this many measures can be policy-relevant. If a few "key" indicators are selected, then the objectivity of RAND's model is compromised by a rather subjective process.

In order to further discuss some of these contradictions, we shall now review some of the criteria from which indicators are developed and evaluated.

Criteria for Judging Indicators

Throughout the literature on educational indicators, scholars provide lists of criteria for choosing indicators. The single most frequently cited criteria is in regards to the technical quality of the data including the issues of reliability and validity (Blank, 1986; 1993; McPherson, 1993; Meyer, 1994; Murnane, 1987; Nuttall 1994; Porter, 1991; Shavelson, McDonnell & Oakes, 1989; Smith, 1988; Stronach, 1993; Texas Education Agency, 1996). Reliability concerns the quality of measurement and suggests that the same data would be obtained each time in repeated observations of the same phenomenon. A measure is valid if it accurately reflects the concept that it is intended to measure. Reliability and validity are certainly critical to indicator development and use. As Koretz (1992) details, the threats to reliability and validity that educational indicators are particularly prone to stem from the characteristics of the indicators themselves, the indicator systems, and the ways in which they are used. For example, indicators currently are often used to support broad inferences, rely on simple and corruptible measures, are context-dependent, are often available for only a sparse array of measures, and are narrower that the effects of the policies that they are intended to monitor. One problem with these technical criteria is that they are inextricably bound with the model or framework from which the indicators are derived. Even if the measures in a meaningless framework are reliable and valid, they are still meaningless. Reliability and validity alone do not qualify indicators to be taken seriously.

Another criteria frequently found in the literature is that indicators be derived from a model of the education system (Blank & Gruebel, 1993; Cooley, 1992; Hafner & Buchanan, 1992; Jones & Nielsen, 1994; McDonnell et al., 1990; McEwen, 1993; Nuttall, 1994; OERI SASG, 1988; Shavelson, McDonnell & Oakes, 1989). Of course, these are the advocates of the model approach to indicators. With this criteria we are placed back into the aforementioned problems of the difficulty of modeling such complex phenomena and there being no single agreed upon model of the education system. Also, a popular criteria for educational indicators is that they be policy-relevant and include aspects that can be manipulated by policies or programs (Cooley, 1992; David, 1987; Hafner & Buchanan, 1992; Jones & Nielsen, 1994; Nuttall, 1994; OERI SASG, 1988; Shavelson, McDonnell & Oakes, 1989; Smith, 1988). To require that an indicator measure something that is alterable is by definition constraining the potentialities of the indicator system. This automatically locks you into the "way things are always done," the status quo. To create indicators that are specifically policy-relevant implies that the "levers for change" are already known.

Many also cite feasibility (Blank, 1986; 1993; Hafner & Buchanan, 1992; Nuttall, 1994; Raizen & Jones, 1985; Shavelson, McDonnell & Oakes, 1989; Smith, 1988; Stronach, 1993; Texas Education Agency, 1996) and cost (Porter, 1991; Fitz-Gibbon, 1996; Hafner & Buchanan, 1992; Nuttall, 1994; Raizen & Jones, 1985) as important criteria for indicators. It is interesting to note that cost is cited as an important criteria much less often than the others.

Finally, a few are cognizant of some of the problems of the external imposition of indicator systems onto local districts and schools. Indicators must produce information that is

useful at the local, state, and national levels and indicator systems should respect the autonomy of and be sensitive to differing state and local definitions (NEGP, 1993). Nuttall (1994) cites criteria from a pluralistic view which contends that all the partners in education need to have a sense of ownership of the indicator system. One way to help ensure this is to adopt a grassroots, participatory approach to developing indicators. Levesque, Bradby, and Rossi (1996) go a step further and claim that indicators should be rooted in local goals.

What is clear to us in these criteria is the contradictions between some of them. As mentioned earlier, the model and policy criteria conflict with each other. The model approach ends up being too complex for policy. Also, the feasibility criteria potentially conflicts with the model criteria as well. Some parts of the educational system are simply not able to measured and adequately quantified. Those who advocate the local criteria are not supportive of the model approach and it is clear that these criteria would conflict. The former is grassroots and participatory while the latter is externally imposed by the scientific community. The technical criteria tend to contradict the cost criteria since the steps to ensure reliability and validity are typically expensive. We could go on, but the point is that these criteria are not all they are purported to be. There is no "cookbook" approach to developing indicators and indicator systems. Criteria should be used to guide the process, but there will inevitably be tensions.

Who Should Be Involved?

An important issue that receives relatively limited attention in the literature concerns who should be involved in developing and operating an indicators system. How an indicator system will be used and, thus, the control it will exert over an educational system determines in large measure who should be involved in specifying what indicators will be included and who will use indicator data to inform decision and policy making.

Informing Policy Discourse

The literature indicates that policy makers can draw on the descriptive and even predictive capacities of indicators systems to identify issues and trends and thus inform policy discourse. Bryk and Hermanson (1993), in particular, emphasize this use of indicators, warning that major theoretical and methodological limitations seriously inhibit the use of indicator systems to manage system improvement. Bryk and Hermanson argue that schools do not possess the chief qualities of highly rationalized bureaucracies. They, instead, treat schools and districts as communities, which are based on a convergence of values. Thus, Bryk and Hermanson explain that individuals at all levels of schools and districts—including parents, teachers, administrators, policy makers and, when appropriate, students—should be engaged in the design and use of indicators systems.

Accountability

As we have suggested, policy makers and educational agencies exert regulatory control when an indicator system is used to hold educational systems, from schools to states, accountable for the quality of educational inputs and/or the level of outcomes. Thus, accountability systems provide control to centralized authorities. This clearly marks who both selects the inputs and/or

outcomes for which the educational system will be held accountable and sets the standards for what is acceptable: centralized policy makers. This is consistent with the assumption on which accountability systems are based: Policy makers exert market-like pressure by monitoring inputs and/or outcomes (Richards, 1988). Subordinate systems are left to their own devices to do whatever they deem necessary to reach the standards. The central authorities then positively or negatively sanction the subordinates systems depending on whether or not they reach established standards.

Evaluating Policies and Reforms

As we noted above, many authors suggest that indicator systems can be used to evaluate the effectiveness of policies and reforms. This use is instrumental because it enables policy makers to use the feedback provided by evaluation to improve the outcomes of educational systems (Scheerens, 1994). This implies that two groups are involved in selecting indicators and using the results of this use of indicator systems. The first are centralized policy makers whose decision making will be predicated at least in part on the results of evaluations. The second are either outside consultants or administrators within the educational system who conduct the evaluation. In either case, the evaluators would guide policy makers in selecting indicators and in interpreting the evaluation results.

System Improvement

Scheerens (1991) proposes the most complex and arguably sophisticated use of indicators systems: providing an information management system to guide system improvement. We argued above that this use of offers technical control because it provides "policy levers" (Odden, 1990) to improve system outcomes. The creation of such a system must be based on a theoretical model of schooling which identifies crucial inputs, conditions, processes and outcomes. Thus, social scientists would work with central policy makers to design the indicator system, analyze indicators data and assist in the interpretation of results.

Some authors disagree. They contend that in order for indicators to be useful to the improvement of system performance, stakeholders at all levels of the system must be involved in choosing indicators and in using indicators data. Citing research that indicates that information seldom affects decision making and planning, David (1988) claims that teachers and principals will be more likely to use indicators to improve instructional practice and programs if they are involved in building the indicator system. Levesque, Bradby and Rossi (1996) also note that people will not use data to develop improvement strategies if they perceive that they were collected for other reasons. They cite an evaluation study conducted by RAND and Management Planning Research Associates for the National Center for Research in Vocational Education which indicates that local vocational administrators and teachers were more likely to use performance measures to improve practice when they participated in developing the measures and related instruments. She also argues that evaluations conducted by outside consultants are often ignored by local educators and reports that some local educators are thus working to build the capacity of local districts and schools to self-evaluate.

Porter (1998) offers yet another perspective on the question of who should be involved in designing and using indicators systems for system improvement. He agrees that district and

school level assessments are more likely to influence instructional content and practice in the classroom than more distant testing programs. He adds that, while educational indicators cannot provide the detail necessary to reveal the nature of individual teachers' practices, indicators "could potentially describe the practices of a representative sample of teachers and other teachers who wished to do so could compare their own practices" (Porter, 1988, p. 507).

Advancing Policy Agendas

Porter (1988) ultimately concludes, however, that the real potential of indicator systems does not lie in their capacity to provide information about the instructional practice of teachers. Rather, he suggests that indicator systems can be used as a political tool. Whoever shapes indicators systems can use them to fix attention on certain conditions and outcomes of educational systems and thus advance particular educational policy agendas. Most discussions explain that indicator systems will serve the needs and interests of policy makers (Burstein, Oakes & Guiton, 1992; Porter, 1988; Nuttall, 1994). But, Porter argues that other stakeholders could advance their interests by influencing the design of indicator systems. Specifically, Porter explains that if teachers participated in designing indicator systems they would advance their professional status by influencing what will be taught and how. Moreover, if teachers are involved in the development of indicator systems, those systems would have greater legitimacy with and thus influence on all teachers.

Discussion

The literature on educational indicators is highly complex and crosscut by ambiguous and sometimes conflicting messages. Thus, it provides few, if any, clear-cut answers regarding how local school systems might use indicators to improve academic performance. Instead, a careful reading of the literature raises several issues with which local policy makers and educators will have to wrestle in developing and operating indicator systems. Here, we discuss three. They begin with how the indicator system will be used. This basic choice will be tempered by two other, related considerations: what are the information demands of the different uses of indicator systems and how do these demands affect the feasibility of using indicator systems in these ways.

Choosing How to Use an Indicator System

The first choice that local school districts will have to make is whether to invest in an indicator system in the first place. In many ways, however, the answer is inevitable, for expectations regarding the use of indicators to improve the performance of public education in the United States run high. The history of educational indicators in the U.S. reminds us that policy organizations, such as the Council of Chief State School Officers, and government agencies, including the Department of Education, have promoted educational indicators as important tools for educational reform. Individual states soon followed by adopting indicator systems for a variety of purposes. Just this year, California enacted its Standards-Based Accountability System which will hold schools accountable for the academic performance of students. Thus, in states such as California, at least, the question of whether local districts will use indicator systems has already been answered.

Once it has been determined that a local educational system will use indicators, the first issue that must be addressed is how the indicators will be used. In states where indicator systems already exist, local districts and schools are obviously bound to their state's uses of indicators, which usually take some form of accountability. However, local districts may also choose to use indicators in other ways. The literature identifies five: to inform policy discourse, to hold subsystems accountable, to evaluate policies and programs, to provide an information management system that informs system improvement and to advance a policy agenda. How does a local system select its use of an indicator system? As we noted, the answer to that question turns in part on the type of control that a district wants to exert.

Informing policy discourse exerts the most indirect control. It is aimed at building shared understanding among educational stakeholders of the issues and problems confronting the district and its schools. This use of indicators could result in the development of a normative form of control, the sort of control that a community exert over its members through a system of shared values. However, it seems unlikely that districts will be satisfied with this form of control. Most of the literature advances a more ambitious agenda. It suggests that indicator systems can monitor schools and districts to hold them accountable for providing sufficient educational inputs and producing adequate academic outcomes, evaluate policy and reform and, ultimately, serve as information management systems to guide the improvement of whole educational systems. Simply facilitating policy discourse does not seem to satisfy policy makers' or scholars' desire for greater control over educational systems.

Thus, local educational agencies may choose to use an indicator system to hold schools accountable, just as the state intends to in California. This exerts a regulatory form of control. Schools that do not meet minimum standards for inputs, instructional processes and/or academic outcomes would be punished and/or those that do meet the standards would be rewarded. Proponents of this form of control argue that it leaves local schools free to determine how best to reach standards.

Using an indicator system to evaluate policies and programs and as an information management system both would exert technical control on local educational agencies. Evaluating the impact of specific policies or programs provides feedback, which local policy makers and administrators could employ to make mid-course adjustments, eliminate policies or programs or adopt new ones.

An information management system would take this several steps further. If proponents of this use of educational indicator systems are correct, such a system would provide ongoing information that people throughout the local educational agency could use to improve policies, programs and practice. To many authors who contributed to the literature on educational indicators, this is the ultimate use of indicators for contributing to the improved performance of educational systems, ranging from nations to local schools and even classrooms.

The final use of an educational indicator system is to advance a policy agenda. The literature suggests that policy makers can accomplish this by selecting indicators to bring attention to particular conditions or outcomes and thus exerts political control. This use of indicators differs from the others because it is not aimed at affecting the internal operations of

local districts and schools, so much as it focuses on the process of policy making itself. The literature pays only limited attention to this use of indicator systems, reflecting its emphasis on regulative and technical forms of control.

Information Demand and System Feasibility

The choice of how an indicator system will be used has implications for the information demands that will be placed on local educational agencies. The level of demand, thus, may weigh in the decision on how the indicator system will be used. Information demand has two dimensions. First, information is more or less dense, depending on the amount of data that is required. Density is function of the number of indicators included in a system and the number of data sources that must be tapped. Second, information demand varies in complexity, depending on the degree to which an indicator system examines relationships between indicators. Information demands vary substantially across the different uses of educational indicator systems, ranging from the high density and complexity of an information management system to the low density and relative absence of complexity in the descriptive data needed to inform public discourse.

Moreover, the level of information demand, in part, determines the feasibility of supporting and operating an indicator system, because information comes at a price. The issue of the cannot be taken for granted, for history provides a potential and not hopeful precedent. Buoyed by the successful use of economic indicators to enact policy that stimulated the U.S. economy, policy makers in the 1960's urged the development of social indicators. However, expectations were quickly dashed when policy makers were unable to use social indicators to prescribe interventions to cure the nation's social problems.

Using an indicator system to hold schools accountable does not require particularly dense or complex information. A general framework, rather than a detailed theoretical model, could be employed to identify key conditions and outcomes that would be included in the indicator system. Such a system would be more parsimonious than extensive, focusing on a manageable set of indicators. In addition, analysis of indicator data would not examine relations between indicators but determine whether or not minimum standards had been reached. However, there is an important cost associated with using an indicator system for accountability. The literature warns that, when used to hold systems accountable, indicators run the distinct risk of being "corruptible"; they can be manipulated and thus may not present a valid indication of an educational system's performance. The most common means of corrupting narrow indicators of student performance, such as standardized achievement tests, is simply to "teach to the test." To insure the validity of the accountability system, the educational system would have to incur the cost of limiting, through oversight, the possibility that teachers and other stakeholders would corrupt indicators. Thus, using an indicator system to hold schools accountable appears to be economically feasible, and may explain why so many states have opted for this use. The downside is that outcome indicators, at least, may not provide valid information about system performance.

The demand for information becomes much more complex if an indicator system is used to evaluate programs, policies and/or reforms. In fact, the literature indicates that indicator systems may not be particularly well suited to this purpose. Some authors caution that indicator

systems, which reflect the overall "health" or status of educational systems, lack the rigor of design and depth of data and analysis necessary to provide valid assessments of the impact of policies or programs. A rigorous indicator system that provides in-depth data about key conditions and outcomes would require informational density and complexity. A detailed theoretical model of schooling would be employed to identify indicators. The number and types of indicators, or information density, would likely be greater than in accountability systems, because evaluation would require assessing the relative impact of a variety of conditions in educational systems in order to estimate the contribution of the focal program or policy. This would also require examining relationships between indicators, thus adding information complexity. Thus, it is likely that costs will rise if an indicator system is used for purposes of evaluation. One alternative is to operate a fairly parsimonious indicator system to assess the general status of the system, which would provide baseline data for more extensive evaluation studies of particular programs and policies.

Information demand would be even greater if an educational indicator system is to be used as an information management system to guide system reform and improvement. The information would be complex, for an information management system would most certainly have to be based on a detailed and comprehensive model of schooling. Even the most ardent promoters of educational indicator systems acknowledge that educational researchers cannot agree on such a model. This raises serious reservations about the technical, let alone financial, feasibility of using indicator systems for evaluation or as information management systems. Moreover, many of the most important inputs, conditions and outcomes of educational systems are difficult and, thus, costly to measure. Finally, the literature indicates that teachers and site-level administrators would have to be involved in designing and using the system if it is to effect improvements in instructional programs and practice. Thus the technical and human costs of using indicators in an information management system would be high, perhaps prohibitively so for small and/or low wealth schools and districts.

The information demands of informing public discourse can be relatively limited. If basic information regarding the health or status of a local system are required, stakeholders can employ a general framework, or set of rubrics, to determine the conditions and outcomes for which indicators will be developed and data collected. Descriptive statistics can be calculated and, overtime, trends can be charted. Thus, information complexity is low. Such an indicator system would also be relatively parsimonious, for a more extensive system could well overwhelm rather than inform public discussion. Thus, it appears that using an indicator system to inform public discourse is quite feasible. But would local policy makers and administrators be satisfied to use an indicator system in this way and not seek to use information to exert greater control?

The literature pays only limited attention to using indicator systems to advance policy agendas and thus does not directly address the information demands of this use. However, it seems that the information demands would be relatively low. Policy makers would establish a general framework based on their particular policy interests. The framework would guide their choices of the conditions and outcomes for which indicators would be developed. Thus, the information demands would be similar to those of using an indicator system to inform public

discourse or hold subsystems accountable. The difference would be that the motivation is expressly political.

The information demands and thus the potential cost of some uses of indicator systems can be quite high. The highest information demands are associated with the technical control exerted through policy and program evaluation and by information-management systems. Both require high density and complexity of information. While using indicators to provide regulatory control through an accountability system has relatively modest information demands—neither dense nor complex—the potential of corruptibility brings with it the cost of oversight. Which leaves two uses of indicators: facilitating discourse and setting policy agenda. Both have relatively modest information demands, requiring neither dense nor complex indicator data and analysis and, thus, appear to be feasible uses of indicator systems. However, neither will enable policy makers and administrators to control the operations or outcomes of educational systems.

That cost and feasibility may undermine efforts of local districts and schools to profit from the use of indicator systems suggests a possible strategy that may be especially appealing to small and low-wealth systems: collaboration. Several districts could join together to design and operate an indicator system, thereby sharing costs. Such collaboration offers other advantages. If the system is used to evaluate programs or policies, the impact of contextual differences across districts on policy effectiveness could be assessed. If indicators are used in an information management system, the involvement of multiple districts could provide two kinds of comparisons. One, the influence of district conditions on student and school performance could be examined. Two, a study could be conducted on differences in information utilization across districts. Finally, if the indicator system is used to forge a policy agenda by focusing on particular conditions or outcomes, a bloc of districts could potentially have much greater regional and even statewide influence that a single district.

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